

The Present South African Coal Mining Industry

To understand the dominance of coal as an energy source in South Africa, it is important to take a look at its beginnings. Coal mining began in 1870 to supply energy to the recently discovered Kimberly diamond fields; this coal was exploited from the Molteno-Indwe coalfield. At the end of the 19th century, as a result of the discovery of the Witwatersrand gold deposits that made South Africa the world's top gold producer, the coalfields in the central basin, e.g. the main coal producing area, were put into production. As subsidiary industries developed, they also became coal users directly, utilising steam coal-fired boilers or indirectly, using coal-generated electricity.

Due to its low cost and relative abundance, coal provides about 75% of South Africa's primary energy requirements. More than 90% of electricity in the country is generated from coal-fired thermal power stations. Also, coal is the third largest mineral export earner in South Africa today, after gold and the platinum group metals. However, there is a major concern over the status of the remaining coal reserves.

Given the present rate of output, approximately 285 million tonnes a year (Mt/a) run-of-mine, and expecting some annual growth in production, in 40 years only 20% of the reserves will remain, most likely as unmineable coal left in the ground due to mining or geological constraints. An important fact to notice is that coal reserves differ from coalfield to coalfield, in rank, type and quality. Once the Central Basin (Witbank, Highveld, Ermelo and Northern KwaZulu-Natal coalfields) reserves are mined-out, some of the best coal qualities for export and local use will come to an end.

The Coal-Chain

This is the series of events, beginning at the coal mine and ending at the coal consumer's location that describe the elements of coal economics e.g. the steps designed to create a coal product from the "raw" material deposited in the coalfield. These events are:

- **Extraction**

In 2002, South Africa's run-of-mine coal production decreased to 285 Mt, compared with 290 Mt in 2001; some 220.2 Mt was of saleable quality. Production increased in the Witbank, Waterberg, Ermelo and Klipriver coalfields and decreased in the Highveld, Vryheid, Utrecht and Nongoma coalfields. A total of 63.2 Mt of coal discards were generated, mainly due to an increment in coal processing and a general decrease in quality. More than 71% of the saleable coal production was supplied by mines controlled by the three largest mining groups, viz. 26% by Ingwe (BHP Billiton), 23% by Sasol and 22% by Anglo Coal. Mpumalanga, produced 79% of the run-of-mine coal, whilst the Limpopo Province only 12% and the Free State 8%. The remaining 1% was produced by KwaZulu/Natal. During 2002, opencast mines provided 50% of the run-of-mine production. The seven largest collieries (more than 10 Mt/a) were responsible for 55% of the total output. Six large mines (more than 5.0 Mt/a) produced 19%, nine medium sized mines (more than 2.0 Mt/a) produced 14% and 32 small mines (less than 2.0 Mt/a) made up the remaining 12%. As a result of the shift to more productive and less labour intensive mining operations, the coal mining industry's labour force decreased again from 50 000 to 43 000 from January to December 2002, while the number of collieries decreased from 55 to 54.

- **Processing**

The overall quality of South Africa's reserves is of relatively low-grade and with high-ash content. To overcome this handicap, most coal processing technologies used are state of the art, geared to make efficient use of the low-grade coal reserves. Some of the Eskom power stations and Sasol's coal-to-liquids and chemicals plants use mainly "raw" coal as feedstock, while the supply to the metallurgical local market, the industrial small boiler sector and some of the "merchant" or household markets is washed to improve quality. These beneficiated product users together only comprise approximately 15% of the total domestic market of 158 Mt/a. The demand for high-grade beneficiated coal on the South African domestic market is therefore limited and it is likely that sufficient reserves of low-grade quality could be available to supply the demand in 90% of domestic markets in the medium to long-term future. The main user of washed coal however, is the South African coal export industry.

South Africa currently exports 30% of its annual saleable output, which is high-grade coal obtained through intensive beneficiation of low-grade production. Uncertainty exists on the amount of suitable reserves amenable to processing to sustain the current rate of South African exports. This reasoning is based on the reserve situation of the Witbank and Ermelo coalfields from which most of the exports are originated. Some large export collieries have reached mid-life and there is limited availability of large blocks of coal reserves for future exports.

- **Transportation**

Coal is a bulk commodity, and transporting it from mine to customer, usually increases the pit-head cost by a considerable amount. Although the distance from the main coal basin to the main coal export terminal, Richards Bay Coal Terminal (RBCT) is large, the main reason why the export industry has been so successful is the CoalLink rail line that transports coal from the exporting mines to the RBCT. The transportation price quoted by the CoalLink line MD is about US\$0.01/t per kilometre. The average cost for all mines is R63/t per ton. These prices have made it possible for South African coal to compete successfully with Australian and Colombian coals.

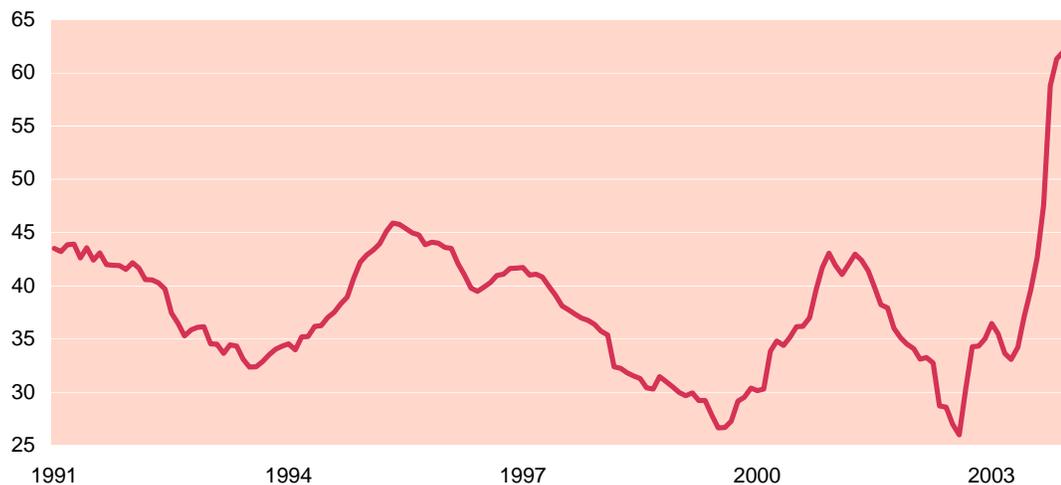
In the area of coal transport to local users, the infrastructure is less efficient, but distances are small and the use of conveyor belt, rail and road transport does not make coal too expensive to use, with exception of areas like Cape Town and perhaps KwaZulu-Natal. Most of the power station coal is transported by conveyor belt, given the fact that most of these collieries are very close to the power station they serve.

- **Marketing**

Coal being such a complex mixture of organic and inorganic matter, it can be modified, at mine and plant, to suit a number of end-users. The marketing of such a range of products, always keeping prices competitive and at the same time optimising carbon usage, is a real challenge.

South Africa's coal products go to two main markets: best grades, with exception of anthracite, go to export, medium to low grades and metallurgic anthracite go to the inland market. Local coal users have been a "captive" market. With no other cheap sources of energy available, it was always easy, for producers to sell their products, including even some discards, with high ash content, that go to agents or merchants and became "household coal". The advantage of having these two markets, for products usually from the same mine, is that the high-priced export product subsidises the low-priced inland product. South Africa's production revenue is 55% from export and 45% from local sales. These figures alone show the importance of South Africa's overseas market. In recent years, the South African coal export industry has suffered several setbacks. Global coal prices declined steadily from a high in early 1997 and only began a slow recovery in November 1999. As a result of an unexpected, very high demand from Europe for power generation steam coal, also affecting Asian and American coal markets, steam coal prices, have risen from US\$25.98 to US\$58.80, in the past fourteen months. This represents an increase of 126% and at the moment, the price is still increasing. (See *International Coal Report Steam Coal Marker Price Chart*)

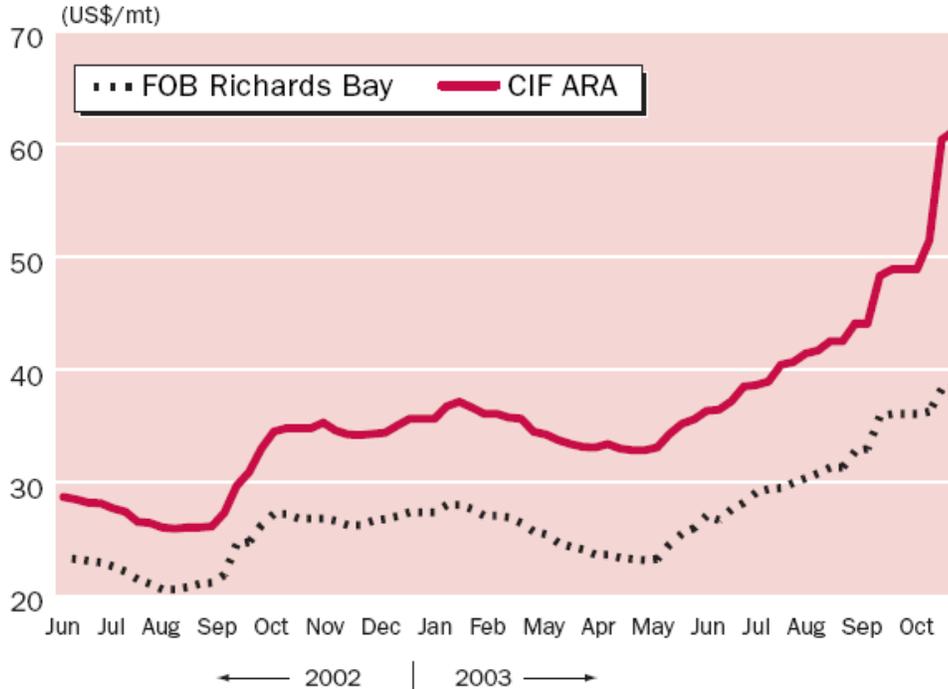
International Coal Report Steam Coal Marker Price 1991 – December 2003 (Spot CIF NW Europe, 6000 kCal/kg)



As can clearly be seen from the Platts ICR Chart below, the RBCT FOB and the ARA (Amsterdam-Rotterdam-Antwerp) CIF coal prices are so closely related that it is obvious that South Africa's steam coal major trading partner is the European Community. Statistics released in 2002 show that 74% of

the total South African steam coal exports then went to Europe. It is expected, when the figures for 2003 are released, that the European exports will rise to 84%.

Platts CIF ARA vs FOB Richards Bay



Source: Platts

- **Utilisation**

The inland coal market in 2002 recorded sales of 157.6 Mt, valued at R11.773 billion. The electricity sector purchased 92.4 Mt. The synthetic fuels sector used 41.5 Mt, whereas the industrial sector, including mining, utilised 12.8 Mt. Total sales of anthracitic and bituminous coal to the metallurgical industry increased by 5.8 Mt.

Although coal is mainly utilised in combustion, e.g. to burn and produce heat energy, the uses of coal and coal-derived chemicals are many. We could justly say that we live in a coal-dominated society. From paints to plastics, explosives, fertilisers, synthetic fibres, carbon products and reductants. There is no industry that does not depend heavily on coal and not just for electricity.

- **Discards**

In parallel with the high production of ROM coal, is the resultant output of discard material, a total of 63.2 Mt or 29% of the total country production in 2002. Some of the Eskom collieries, producing ROM coal, turn out little or no discards. Their only coal preparation consists of de-stoning or removing the larger inclusions of shale or sandstone. On the other hand, coal beneficiation plants in collieries mainly dedicated to the export market, as a result of their products' quality constraints, have coal-bearing discards which, if not stored properly, thus preventing their oxidation and ultimately spontaneous combustion, are the main source of air, water and ground pollution. Latest figures give an accumulated discard tonnage of more than 1.0 billion tons. These discards were located and an estimated tonnage and quality given, as part of the latest inventory of coal discards produced by the Department of Minerals and Energy. The second phase of the study will look at the utilization of discards.

The Economic Empowerment Component

Economic empowerment (EE) has become the buzzword in and around the large mining houses over the past few years. There has been much talk, speculation and even some action with respect to the development concerning economic empowerment. The final realisation of economic empowerment will come now as the *Mineral and Petroleum Resources Development Bill* is implemented. This legislation will have a great impact on the junior coal-mining sector. Due to the underlying principles in the Bill of "use it or lose it", many of the large mining concerns will be placed in the position where they will have to take inventory of their reserve base. Those reserves considered by them to be too small and/or uneconomical, will be prime targets for acquisition by the smaller mining concerns. This will definitely increase the growth of the small coal-mining sector.

The coal industry is attracting much interest from entrepreneurs, many of them from previously disadvantaged backgrounds. While South Africa is welcoming investment interest from new entrants, there are many hurdles that need to be overcome to be able to accommodate new participants; these include a scarcity of known reserves, access to capital, marketing, mining and beneficiation know-how and infrastructure for export. At present South Africa's coalfields, especially the Witbank-Highveld coalfields (the Central Basin) are dominated by major international producers, BHP Billiton, Anglo Coal and Xstrata. Other players, such as Sasol Mining, Kumba Resources, Eyesizwe and Total Exploration SA, also have their stake, leaving little space for new participants.

Clean Coal Technologies (CCTs)

The focus of Clean Coal Technologies is the basic science of coal combustion. The specific objectives are to encourage, support and promote research and development that will lead to improved understanding and characterisation of conventional combustion processes; develop techniques that control and reduce solid, liquid and gaseous emissions associated with combustion processes; improve operating efficiency; and identify methods for the effective utilisation of combustion by-products.

In the local power generating industry, the predominant coal-based technology is pulverised fuel (PF) combustion. Clean Coal Science, which incorporates clean coal technologies, as developed by the industrialised countries, will soon become available to South Africa a signatory of the IEA Clean Coal Sciences Agreement (CCS). Clean Coal Technologies (CCTs) are defined as "technologies designed to enhance both the efficiency and the environmental acceptability of coal extraction, preparation and use". These technologies reduce emissions and waste and increase the amount of energy obtained from coal.

Conclusion

The future of coal in South Africa is linked to a number of issues, of which the new mining legislation, future access to potentially economically viable reserves, access to export infrastructure for independent producers and the implementation of clean coal technologies, are most important. If government and industry co-operate to overcome the problems caused by the re-shaping of the industry, coal's status as the country's cheapest and main energy source will remain uncontested for a long time. The industry's local market is closely related to the export market, which provides the revenue that permits local coal prices' relative stability. Without exports, most mines will need to increase their inland coal prices, resulting in an overall increase to the cost of electricity and placing the sustainability of the whole South African industry at risk.

The assessment of the industry performance during the following two or three years is very difficult, since the outcome of many coal-related issues will only be seen in a year's time, when some or all outstanding coal projects, including the Richards Bay Coal Terminal Phase V expansion, will take place. By 2005-6 coal production and exports could increase by 10 to 15%. The reassessment of the remaining coal potential in the Central Basin will give many economic empowerment companies reserves they require to enter the industry. Some of these companies have already opted for partnerships or joint ventures with some of the existing coal companies – a quicker way to enter the coal industry, but one that will not bring the desired increase in production and exports.